

A photograph of a healthcare professional, likely a nurse, administering a vaccine to a young girl. The nurse is on the left, wearing a white coat and a stethoscope, looking down at the girl. The girl is on the right, looking up at the nurse with a calm expression. The background is a soft-focus hospital room with white curtains.

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High performance. Delivered.

**Presentation for Maryland Health Care
Commission Task Force
July 9th, 2007**

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This presentation discusses a NHIN Architecture Prototype project made possible by a contract from the Office of the National Coordinator for Health Information Technology (ONC), DHHS. The content is solely the responsibility of the authors and does not necessarily represent the official view of ONC.

What we set out to do



- Build a secure NHIN prototype that leveraged existing infrastructure and:
 - Allow patient control of their health information
 - Connect systems with a wide variety of IT platforms
 - Deal with the critical issues of data normalization
 - Provide enough flexibility to allow local choice in the degree of centralization of data
 - Provide a personal health record, provider access to critical clinical data, and allow public health researchers access to data to support business intelligence and decision support
- Show we could quickly build out regional HIEs

What we set out to do



- Allow patient choice regarding which providers can see their health care data
- Provide robust auditing capabilities
- Place filtering within the provider organizations to allow local choice regarding the degree of data sharing
- Design an architecture that is flexible regarding where data is stored
- Convert local messages to HL7 V3 standard messages
- Map local terminology to federal standard terminology (LOINC, SNOMED CT, etc.)

Our Distinct Health Care Markets



Characteristics of our distinct health care markets:

- There is no regional information infrastructures for sharing health data
- Hospital and provider systems are widely diverse
- Few systems based on federal health standards
- Very representative of the US health care market
- Required rapidly building RHIO capabilities, leveraging existing

S



Accenture Healthcare & Technical Partners



West Virginia Medical Institute

- New River Health Association - Beckley
- Cabin Creek
- ARH-Beckley
- ARH Summers County
- AMFM-Beckley
- WV University Physicians of Charleston

The Commonwealth of Kentucky's Eastern Region Health Community

- ARH-Hazard Regional Medical Center and Family Health Services
- University of Kentucky Clinic
- University of Kentucky HealthCare Chandler Medical Center
- Kentucky River District – Letcher County Health Dept
- Kentucky River District – Perry County Health Dept

CareSpark

- Holston Medical Group
- Mountain States Health Alliance
- Johnston Memorial Hospital
- Sullivan County Regional Health Dept.

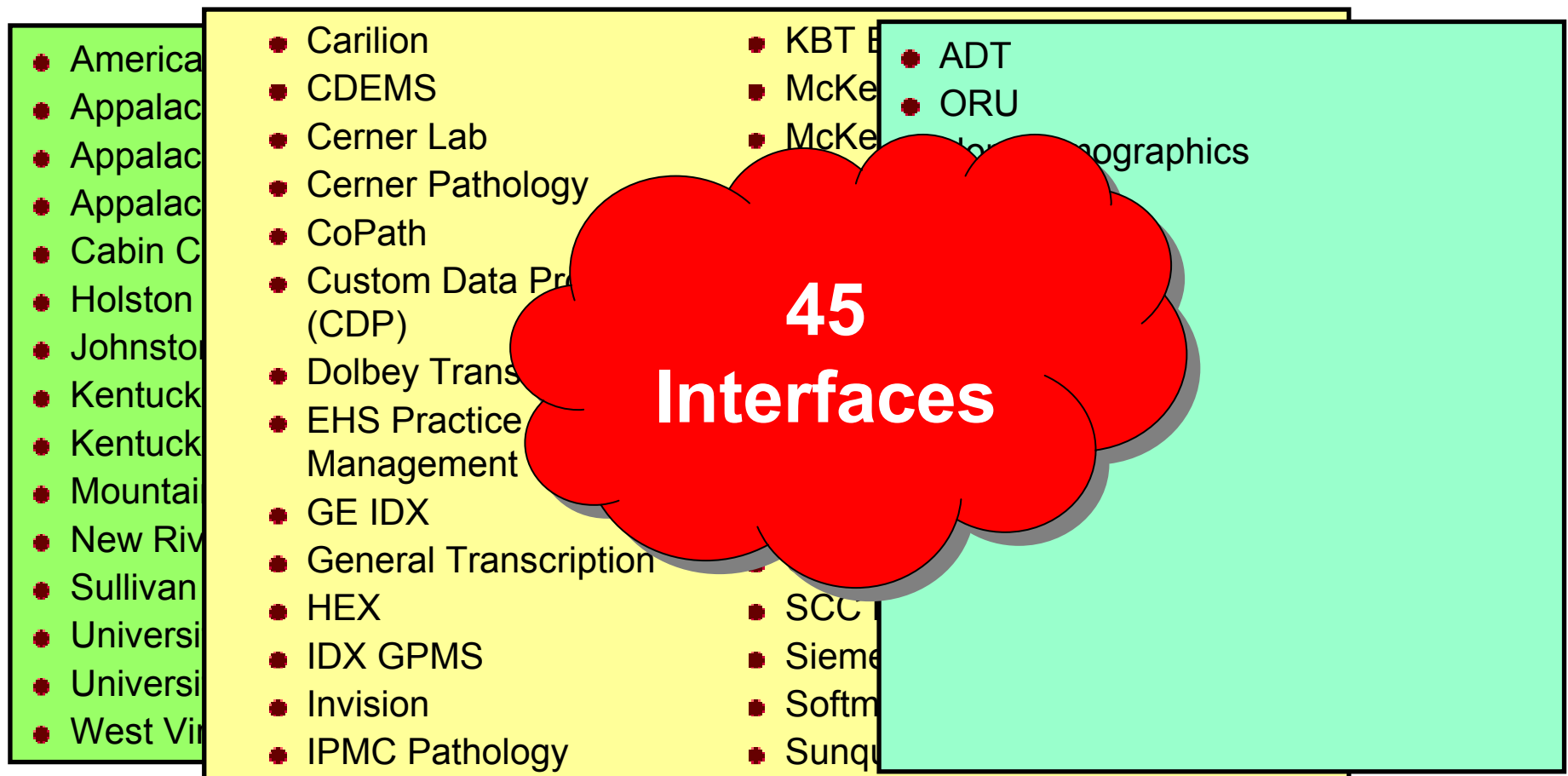
Core Technical Components

- Cisco Systems
- Initiate Systems
- Oracle
- Orion
- Quovadx
- Sun Microsystems

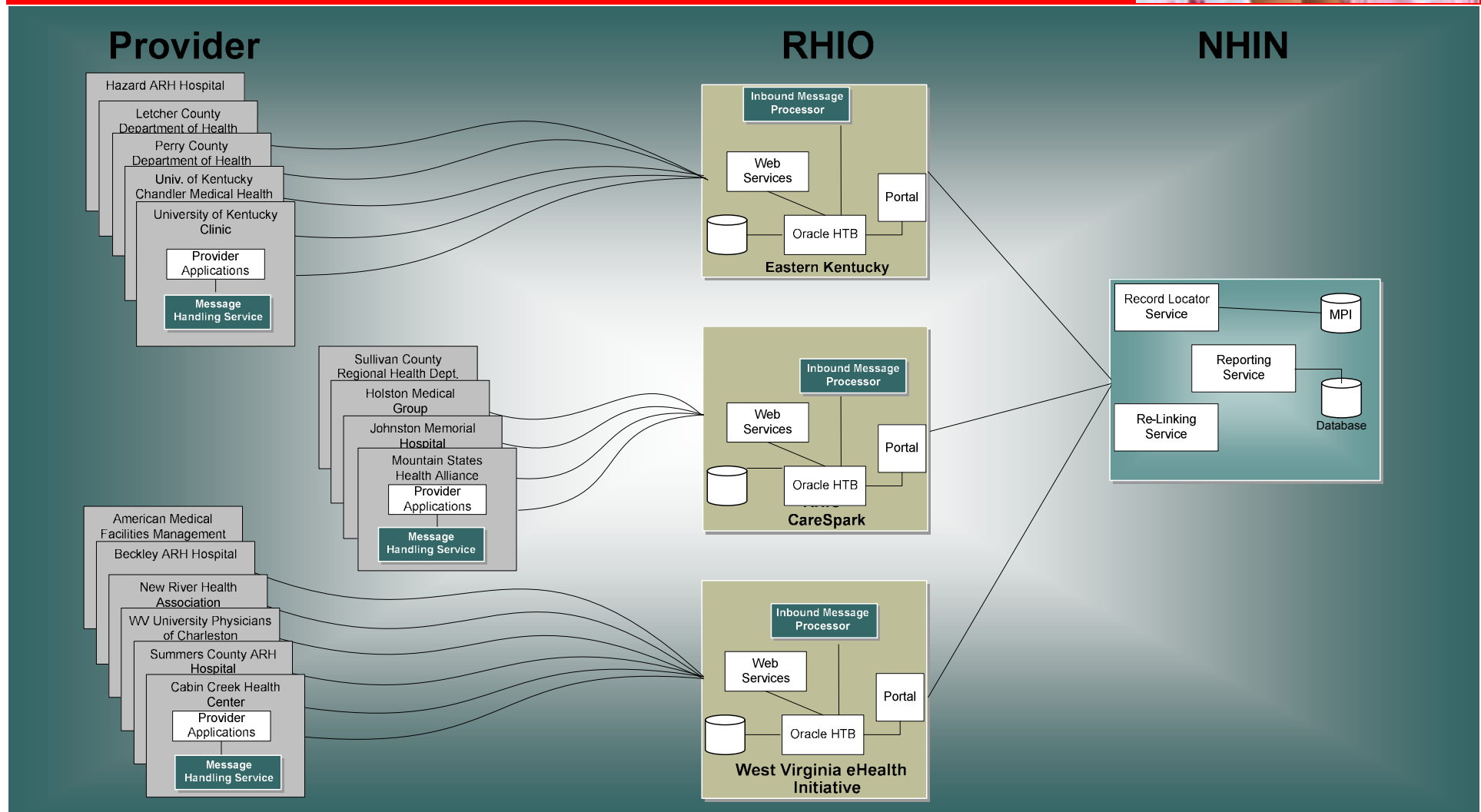
Technical Partners

- Apelon
- AMA
- BEA
- CCSi
- CGI – Federal
- Intellithought
- LucentGlow
- Oakland Consulting Group
- Reactivity
- Red Hat

Provider Organizations



Accenture's Solution Overview

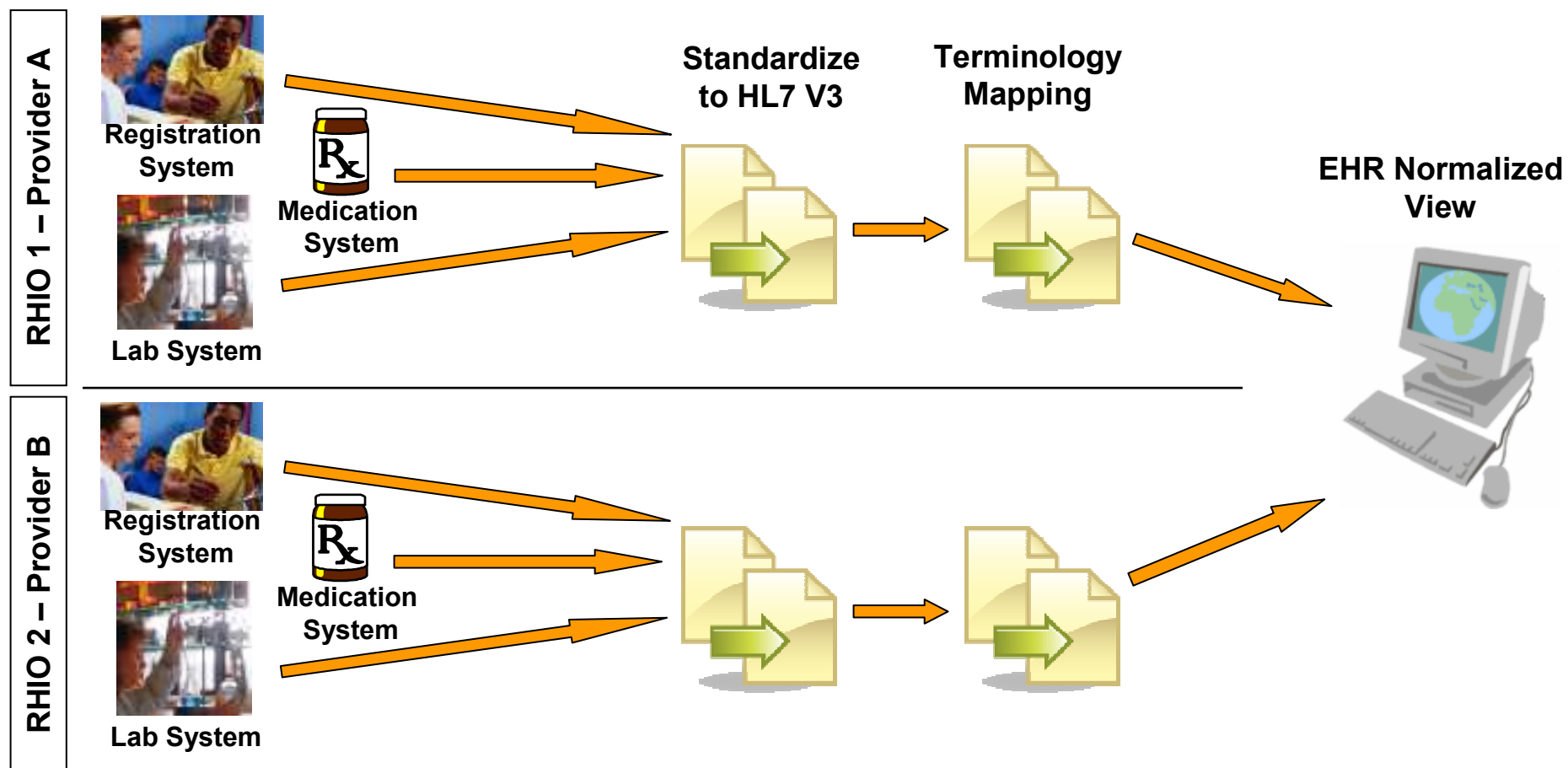


Key Considerations When Designing HIEs



- Sits alongside and leverages investment in current provider EHR and lab systems
- Only sends permissioned data outside a provider organization's firewalls
- Heavy emphasis on data standardization
 - Critical for public health, care management, clinical research
- Sophisticated Information Governance
 - Crucial for obtaining patient trust
- Flexible, Hybrid Architecture
 - Allows for increased control of where data resides (Federated vs. Centralized)

Standardization & Terminology Mapping



Data Standardization



Local Message (e.g HL7 V2.3.1)

Standard Message (HL7 V3 - HTB)

```
TextPad - [C:\Documents and Settings\thomas.f.howard\Desktop\10-7
File Edit Search View Tools Macros Configure Window Help
MSH|^~^&|LAB|JCMC|SMS|JCMC|200609081457||ORU^R01|10520
PID|1||000463418^^JCMC^MR~32203199^^JCMC^AN||TEST^AP
OBR|1||000625100013|LAB7260466A^UA|||200609081439|||
OBX|1|ST|3500160^APPEARANCE|BLOODY|CLEAR|R||F||200
OBX|2|ST|3500140^COLOR|YELLOW|YELLOW|||F||20060908
OBX|3|ST|3500180^PH|6.5|< 6.0|||F||200609081439||
OBX|4|ST|3500260^PROTEIN|30 MG%|NEGATIVE|R||F||200
OBX|5|ST|3500120^GLUCOSE|NEGATIVE|NEGATIVE|||F||20
OBX|6|ST|3500240^KETONES|40 MG/DL|NEGATIVE|||F||20
OBX|7|ST|3500100^U BILIRUBIN|MODERATE|NEGATIVE|R||F
OBX|8|ST|3500220^BLOOD|LARGE|NEGATIVE|R||F||200609
OBX|9|ST|3500660^NITRITE|NEGATIVE|NEGATIVE|||F||20
OBX|10|ST|3500280^UROBILINOGEN||.1 EU/DL||<1.0|||F||
OBX|11|ST|3500200^SPEC GRAVITY|1.015||1.015-25|||F||
OBX|12|ST|3500300^WBC/HPF|5-10|0-2|A|||F||200609081
OBX|13|ST|3500320^RBC/HPF|TNTC|0-2|A|||F||200609081
OBX|14|ST|3500340^BACTERIA|NEGATIVE|NEGATIVE|||F||
OBX|15|ST|3500460^SQUAMOUS EPITH|2-5|0-2|A|||F||200
OBX|16|ST|3500225^U LEUKOCYTE EST|SMALL|NEGATIVE|R||
```

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<high inclusive="true" value="200609081439-0500"/>
</activityTime>
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  <Patient htb:association="role" type="Patient" classCode="PAT">
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        <suffix encoding="TXT" mediaType="text/plain" partType="SFX">TEST</suffix>
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  <contextConductingInd value="true"/>
</component>
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El. 3 U Registered to Tom (HL7 Control Query TC) ©1998-2003 Altova GmbH & Altova, Inc. Ln 71, Col 69
```

(or Local Flat File)



Developing an Implementation Guide for HL7 v3 Messages HL7/NLM/ASPE/GPI Project



Dynamic model generated from same source that builds interaction schemas for consistency and correctness.

Implementation Guide - Microsoft Internet Explorer

Address: C:\NLM\IGT_Demo\IGT_R1\Doc\IGT_HTML_Content\Index.htm

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Interactions

1.1.1.1 Inpatient admission - Encounter Activate w/o RR

	Identifier	Business Name	Description
Interaction	PRPA_IN000001	Inpatient admission - Encounter Activate w/o RR	This interaction is an Inpatient admission, Encounter Activate with Receiver Responsibilities (i.e., the sending system utilizes messages that do not require application-level responses). This interaction signals the admission of an inpatient.
Transmission Wrapper	MCCI_MT000100HT03	Send Message Wrapper	
Control Act Wrapper	MCAI_MT000001HT03	Control Act Wrapper	
Payload	PRPA_MT400001HT03	EncounterEvent	

1.1.1.2 Inpatient discharge - Encounter Activate w/o RR

	Identifier	Business Name	Description
Interaction	PRPA_IN000002	Inpatient discharge - Encounter Activate w/o RR	This interaction is an Inpatient discharge, Encounter Activate with Receiver Responsibilities (i.e., the sending system utilizes messages that do not require application-level responses). This interaction signals the discharge of an inpatient.
Transmission Wrapper	MCCI_MT000100HT03	Send Message Wrapper	
Control Act Wrapper	MCAI_MT000001HT03	Control Act Wrapper	

My Computer

Sample Outputs – Static Message Model Walkthroughs



Diagrammatic message representation directly harvested from core HL7 tooling.

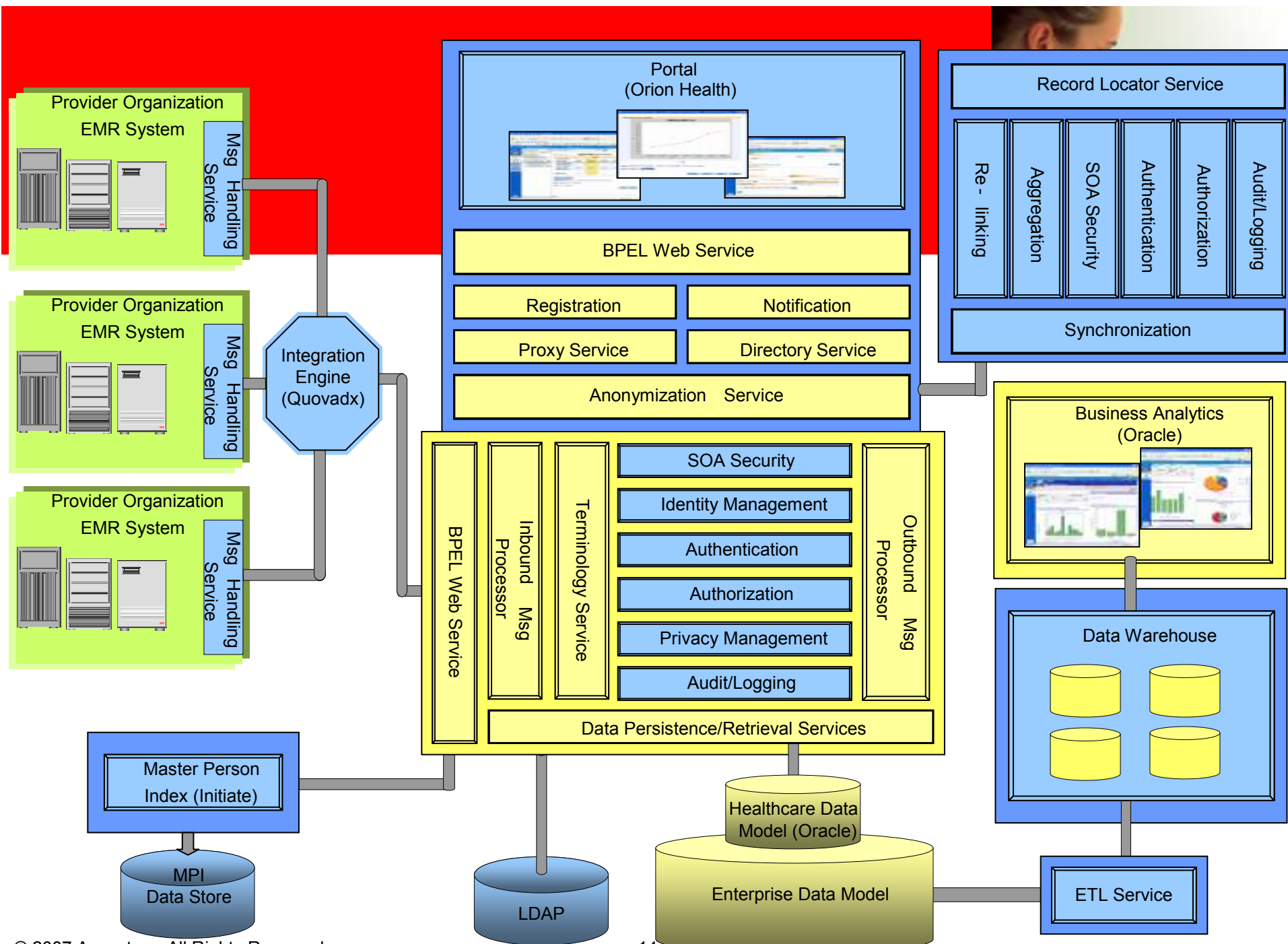
Detailed attribute documentation harvested directly (no double entry!) from formal specification for accuracy and completeness.

Terminology Normalization

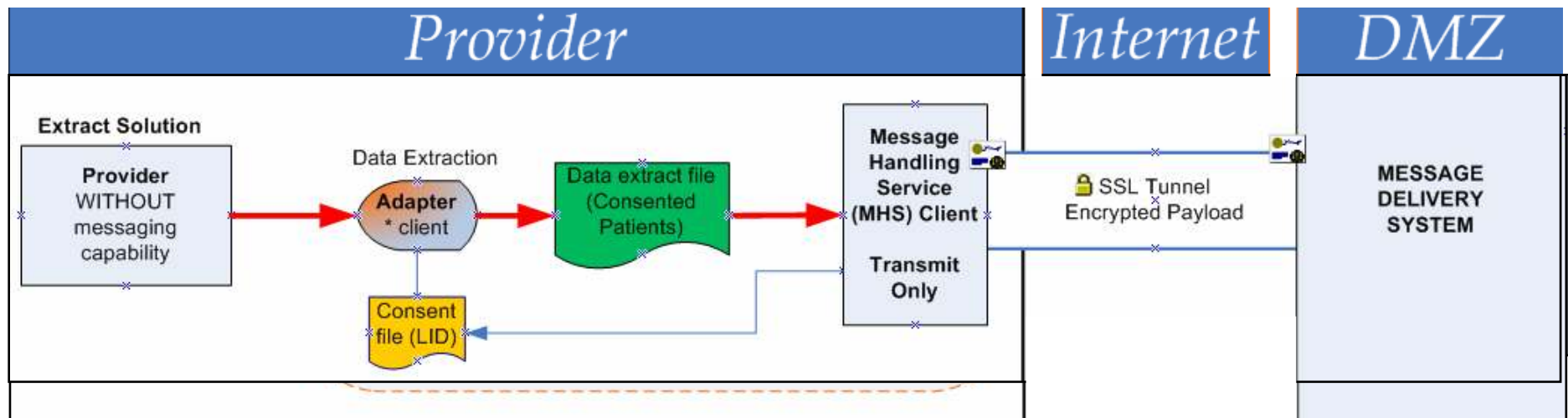


Lab Code Mapping

Local Code	Local Description	LOINC Code	LOINC Description
RF	RHEUMATOID FACTOR SCR N	33910-1	RHEUMATOID FACTOR:ACNC:PT:SER:ORD:
RFT	RHEUMATOID FACTOR QUANTITATIVE	6928-6	RHEUMATOID FACTOR:ACNC:PT:SER:QN:EIA
RA	RHEUMATOID FACTOR QUANTITATIVE	2028-9	2028-9:CARBON DIOXIDE:SCNC:PT:SER/PLAS:QN::
RHEU	RHEUMATOID FACTOR	13457-7	CHOLESTEROL.IN LDL:MCNC:PT:SER/PLAS:QN:CALCULATED
CO2	CARBON DIOXIDE	11156-7	LEUKOCYTES:MORPH:PT:BLD:NOM:
LDLLL	LDL CHOLESTEROL CALC		
LDLCALC	LDL CHOL CALC		
LEU	Blood Leukocytes		

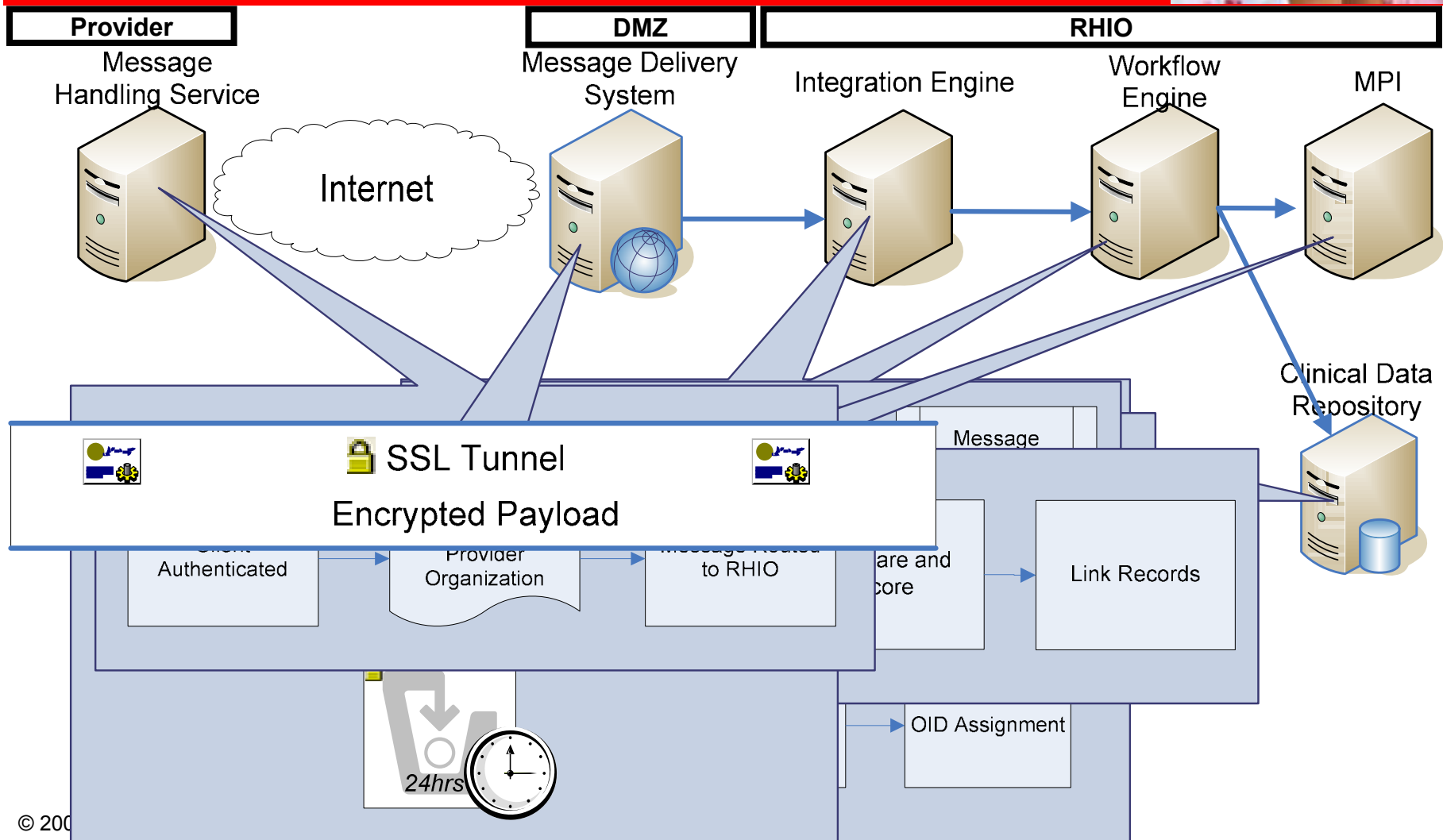


Messaging Architecture – Provider Communication

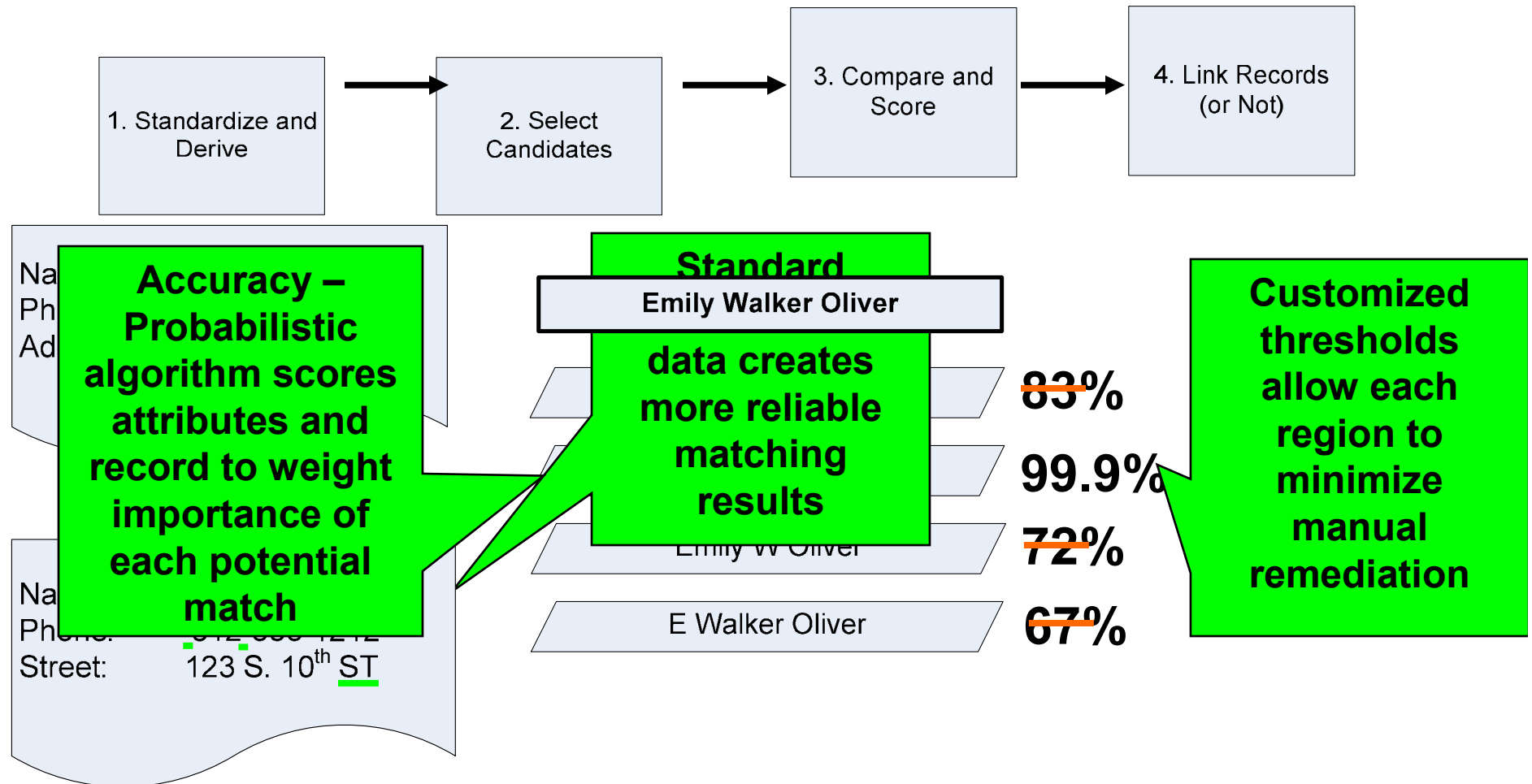


Blind Filing Solution

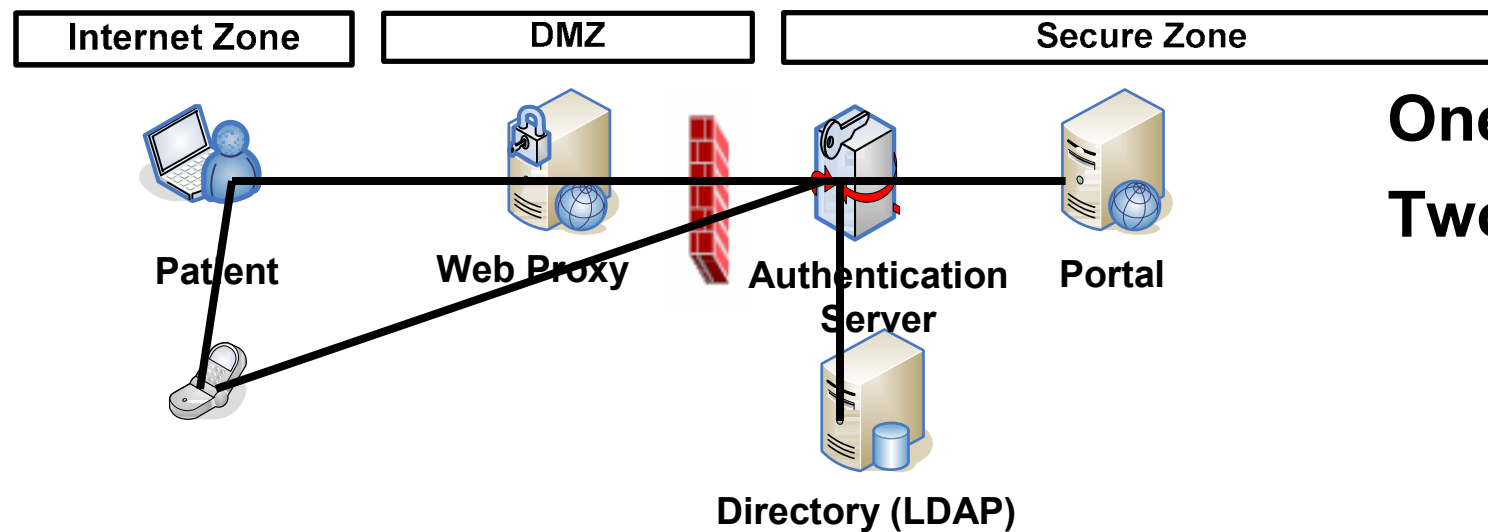
Messaging Architecture



Enterprise Master Person Index (EMPI)



Security Architecture - Authentication



A flexible authentication architecture is key!

Security Architecture - Authorization



Role Based Access Control

What Data Types or System Functions can be used by the User

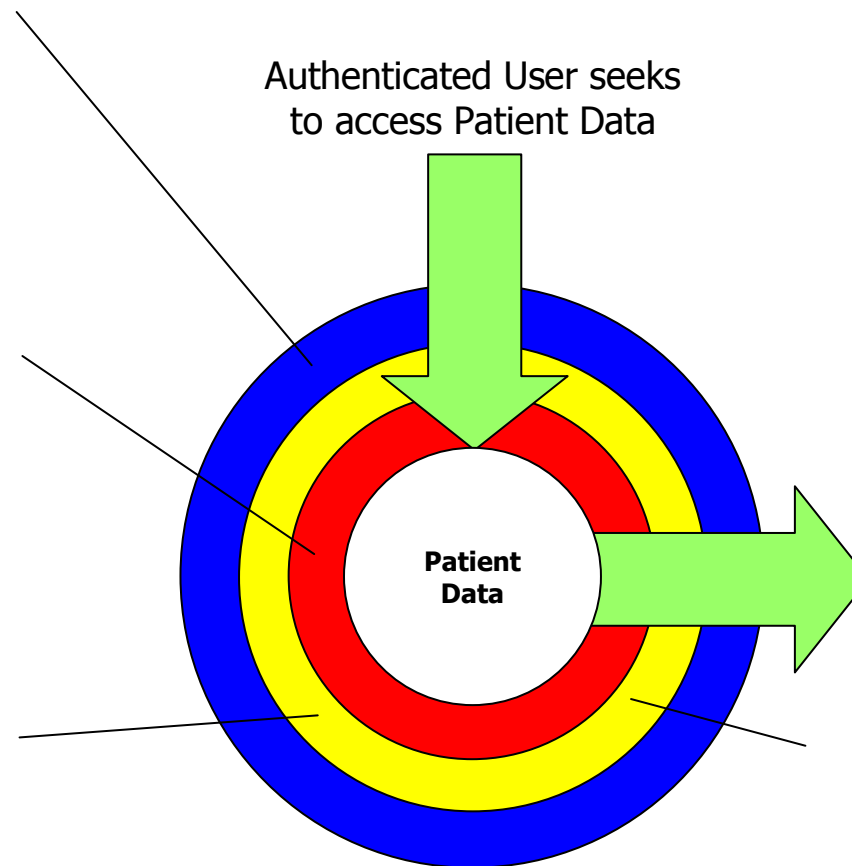
Patient Consent

Has the Patient consented to information being shared outside of authoring organization?

Patient Provider Relationships

Does a relationship exist between the Patient and the User?

Authenticated User seeks to access Patient Data



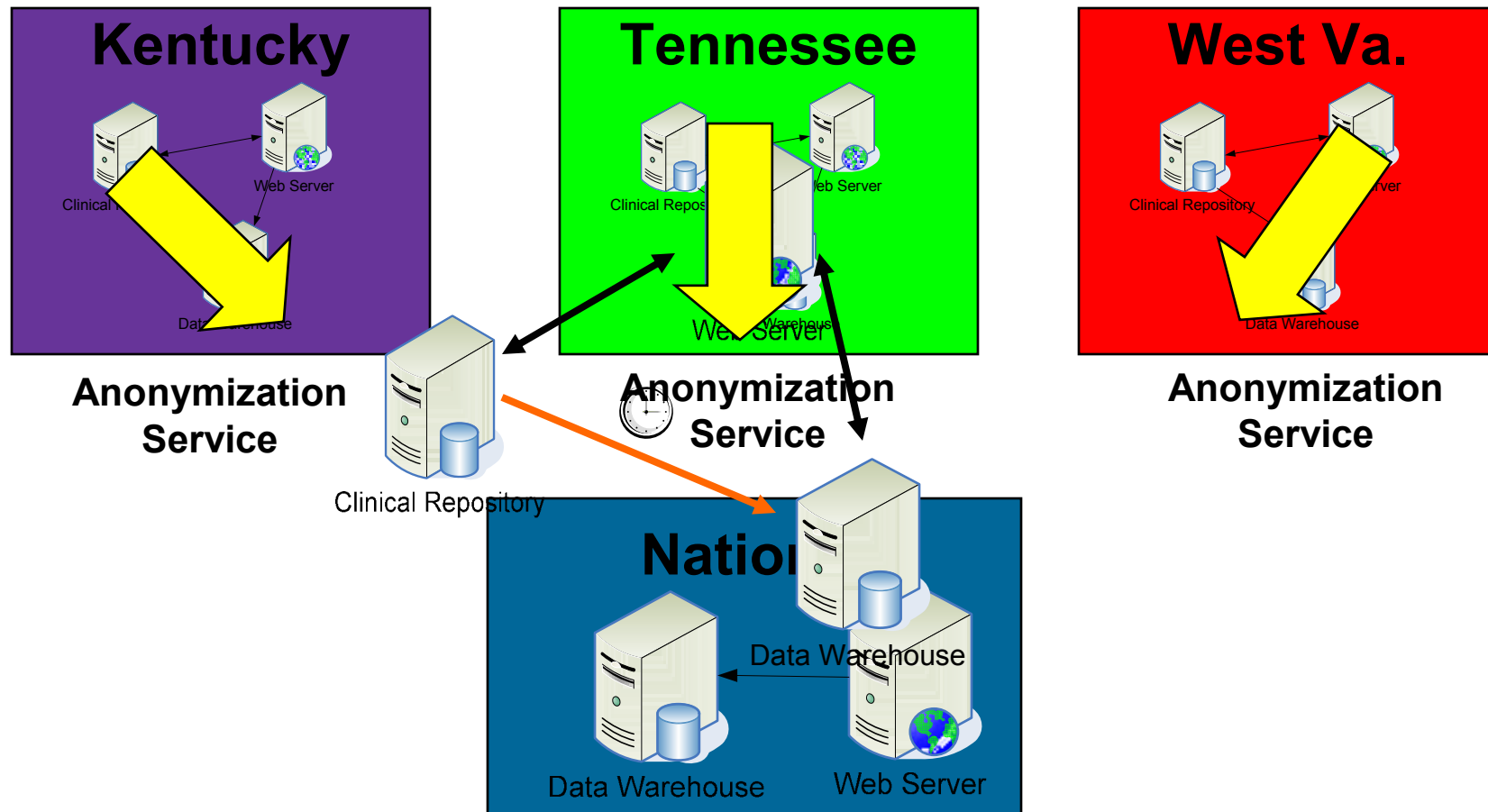
Pseudonymisation and Anonymisation

To enable use of data for secondary purposes

Block List

Has the Patient restricted the User's access to their record?

Reporting Architecture



Prototype Successes & Challenges



- Building a NHIN requires teamwork between a complex and large number of stakeholders
- Incentives must be aligned and be of sufficient magnitude to promote health data sharing for the NHIN to succeed
- Data can be extracted from a wide variety of provider systems and converted into semantically normalized data
- Flexibility regarding architecture will be critical given the variety of views regarding privacy
- OUR CONSORTIUM SUCCEEDED IN DEVELOPING A NATIONWIDE HEALTH INFORMATION NETWORK PROTOTYPE